Diagnosis of Industrial Skin Diseases*

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IT is important to determine whether a dermatitis from which a worker is suffering is of industrial origin—(1) because it has a direct bearing on the treatment of the case and on the prevention of its recurrence; (2) because of the compensation involved; and (3) in order to determine who pays the physician's fee.

If it can be determined that the dermatitis is due to exposure to certain occupational skin hazards, then the major portion of the treatment consists in preventing further contact with these hazards, that is, removing the patient from his working environment, or providing him with suitable protective clothing. In these cases the prevention of the recurrence of the disease consists in preventing contact with the offending material either by methods stated above or by installing proper safety measures, such as totally enclosed processes, adequate ventilation, clean work rooms, clean clothing, etc.

The compensation laws in many of the states are so worded that if a physician undertakes to treat a worker and he makes a diagnosis that the disease is of industrial origin, then his fee is practically taken care of either by the compensation commission or by the insurance carrier. But, if after treating the patient, the physician should determine that the dermatitis is not of industrial origin, the employer or insurance carrier will not pay for the treatment, and the physician must look to the patient for his compensation. You can readily see that this has a tendency to make the physician lean toward a diagnosis of industrial dermatitis because very often his chances of being paid a fee by the poor worker is uncertain. It is to the advantage of insurance carriers and compensation boards to devise means to remedy this condition.

There is no one factor upon which a diagnosis of industrial dermatitis can be made. In most instances the appearance of the lesions gives no clue to the irritant. Especially is this so in the acute and chronic eczematoid types of occupational dermatoses. All of the following factors must be considered and each one forms only a link in the chain of evidence on which a diagnosis of industrial dermatitis should be made:

1. *History*—The history of the dermatitis is most important. In order for the dermatitis to be considered as of possible occupational origin, it must be brought out that such a dermatitis was not present before the patient entered on the occupation. It must also be shown that the dermatitis developed during the period of indus-

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trial exposure, or after a lapse of a reasonable incubation period since the cessation of exposure. This incubation period should not be over a week. If the history shows that other workers similarly employed are similarly affected, or that new workers at the process are usually similarly affected, then the possibilty of a diagnosis of industrial dermatitis is strengthened. If the history should disclose the fact that the patient has had similar attacks of dermatitis previous to the present exposure, then the possibility of the present attack being due to his occupation is weakened, but not necessarily entirely done away with, because it may be possible that in his previous employment he may have met with the same irritant or conditions which are now causing his dermatitis. Knowledge by the physician of the working processes in which the patient is engaged and the substances with which he comes in contact is important, because this enables him to know whether the worker is exposed to known irritants or to conditions which tend to cause dermatitis. For instance, if a worker appears with a dermatitis of the hands and forearms and states that he works on a rubber mixing mill, then we know that he is exposed to irritant rubber compounds and is more likely to develop an occupational dermatitis than is a rubber worker who handles only cold vulcanized rubber objects. If the history shows that the dermatitis develops whenever the worker is at work, gets well or improves when he is away from work and again recurs when he returns to work, then the history itself establishes a definite cause and relation factor between the occupation and the dermatitis.

2. *Site of Eruption*—The site of the eruption is also important. In examining patients, they should be completely divested of clothing. This may in many cases reveal areas of dermatitis on portions of the body not complained of by the patient and may give the clue to a proper diagnosis. Occupational dermatitis usually begins on the exposed parts—the hands, the fingers and the forearms, if the offending material is a solid or a liquid; and also on the face and neck, if it is a vapor. The covered parts of the body may also be affected, if fumes or vapors penetrate the clothing, or if the clothing is not frequently washed and becomes saturated with irritant chemicals. Thus, dermatitis may occur on the body of the worker handling irritant dusts which penetrate the clothing, such as finely powdered rubber compounds; or dermatitis may occur on the covered parts of the body when the clothing becomes saturated with petroleum oils and waxes, especially if the worker does not take daily cleansing baths and if he does not change his work clothes daily.

Occupational bacillary infections such as erysipeloid of butchers and verruca necrogencia of cadaver handlers also usually occur on the hands. The malignant pustule of anthrax among hide and leather handlers usually occurs on the head, face and arms.

Occupational dermatitis is also often found at points of friction on the body. The wrist where the ends of the gloves or the sleeves rub; the belt line where the belt or the top of the trousers causes friction; the ankle at the shoe tops; and the neck at the collar line, are all sites where friction aids the action of industrial irritants. Sometimes a dermatitis of undoubted occupational origin may become generalized. This occurs when the irritant is one to which the worker has developed a high degree of sensitivity. Many substances are known to be sensitizers. Nitro, nitroso and the chloro compounds are notorious sensitizers. In such instances a primarily localized dermatitis or burn may also sensitize the

patient and a few days later a generalized dermatitis may develop.

3. *Characteristic Appearance of Lesions*—An industrial dermatitis of the acute eczematoid type begins as an erythema followed by papules and vesicles and, when the vesicles break, by an oozing and crusting, no matter what irritant is the cause.

Occupational mycotic infections, such as ringworm among bath attendants, barbers, beauty parlor operators, and yeast infections among cannery workers, usually occur on the hands, but the appearance is not different from that of ringworm or yeast infections of non-industrial origin.

There are, however, a few classes of industrial irritants which produce more or less characteristic lesions on certain portions of the body. Paronychia and onycholysis are common lesions among fruit and vegetable canners. The chlorinated naphthalenes and diphenyls produce acne-like lesions on the face and on the parts of the body which come in contact with the work clothes if the work clothes are not frequently washed and changed. Certain tar compounds also cause acne-like lesions on the exposed parts. Oils cause folliculitis and boils, especially on the hairy portions of the body. Paraffin, grease and tar cause keratoses to develop on the hands and forearms and these keratoses occasionally become malignant. However, the scrotal cancers reported in England as occurring among mule spinners and chimney sweeps have not been noted in this country. Certain hydroscopic chemicals, such as sugar, salt and lime which remove the water from the skin, and solvents, such as the petroleum distillates which remove the fat from the skin, may over a long period of time cause dry, fissured eczemas. Exposure to certain aniline derivatives, such as alpha naphthylamine and benzidine, are known to have caused malignant growths. Gehrmann has reported papillomata of the bladder among the workers exposed over long periods of time to such aniline derivatives. Arsenic, especially if taken internally, has also caused new growths in the form of keratoses and epithelioma, particularly on the palms and soles. Keratotic lesions and excessive pigmentation around the face and the neck may be occupational among workers exposed to the sun, such as farmers and sailors.

Occupational dermatitis must be differentiated from such diseases as seborrhoeic dermatitis, fungus infections, lichen planus, impetigo contagiosa, pityriasis rosea, erythema multiforme, drug eruptions, neuro dermatitis and dermatitis due to contact with irritants met with outside of the place of occupation. The industrial physician or the general practitioner may at times be in doubt about the diagnosis of these conditions in a worker exposed to an occupational skin hazard, especially if he does not strip the patient and examine the entire surface of the skin, but to the dermatologist the characteristic location or appearance of seborrhoeic dermatitis, lichen planus, impetigo contagiosa and neuro dermatitis and the generalized eruptions of pityriasis rosea, erythema multiforme and drugs offer no great problem in differential diagnosis from occupational dermatitis. It is true that the presence of these conditions does not rule out the fact that an industrial dermatitis may also be present. In fact, the presence of certain of these skin diseases often predisposes a worker to an industrial dermatitis. The greatest difficulty in differential diagnosis is presented by dermatitis due to contact with substances met with outside of the place of occupation. In these cases the lesions are similar in appearance and site, and only the most careful consideration of all the facts can lead to a correct etiology. It is here

that the patch test is of greatest value.

The patch test is based on the theory that if a dermatitis is caused by hypersensitivity to a certain substance, then if that substance is applied to an area of unaffected skin of the susceptible individual and left on for a period of time, it will cause an inflammation at the spot where it touches the skin. In doing patch tests, it is important to know what concentrations of certain chemicals can come in contact with the normal skin for a stated period of time without causing an inflammation or reaction. It is also important that no general irritants, such as strong acids or alkalis are used in the patch test, because obviously they will burn any skin. The portion of the body on which a patch test is to be performed is also of importance because it has been found that the different portions may vary in sensitivity to certain chemicals. For instance, the tough horny skin on the hand is less susceptible to irritants than the more tender skin on the inner surface of the forearm. Then again, it has been found that the portion of the skin which is affected is more sensitive than other portions of the skin. For this reason, patch tests performed on uninflamed skin adjacent to the eruption are more likely to give positive reactions than when performed on more distant areas. It may even be necessary to wait until the eruption heals so that patch tests may be performed on the same portion of the skin which was affected.

If the worker is handling known irritants and his fellow workers are also affected, the cause is obvious and the patch test is unnecessary, but if he is the only one of the group who is affected, then he should be patched with the materials with which he comes in contact in the course of his occupation. If he is patched with only one substance, then a control patch should be placed on him. If he is patched with more than one substance, then any negative reaction from one of these substances serves as a control. It is also desirable to use as a control one of the workers who has no dermatitis.

In patching with solids, best results are obtained by moistening them, preferably with perspiration from the patient which can be obtained from the axilla. Sometimes it may be necessary in order to obtain a reaction from a patch test, to use perspirations of different hydrogen ion concentrations (Ref., Schwartz, Louis. Sensitivity to External Irritants in Industry, *New York State Journal of Medicine,* 36, 24) (Dec. 15), 1936. The results of patch tests must be correlated with the worker's particular occupation, the history of the dermatitis, the site and morphology of the lesion, in order to arrive at a correct etiology. Patch tests are only a link in the chain of evidence on which a diagnosis of industrial dermatitis is made. A positive reaction only shows that the portion of the skin on which the patch was applied was at that time sensitive to the substance with which it was patched. In order to state that this substance was the cause of the occupational dermatitis, we must be sure that the patient was exposed to the substance in the course of his work and presuppose that the patient's skin was also sensitive at the time of industrial exposure.

When negative results are obtained from patch tests with the materials met with in the course of the patient's occupation, we must not hastily conclude that the dermatitis is not of industrial origin, because the skin area over which the patch was placed may not be hypersensitive, while the area covered by the eruption may be hypersensitive. Or, if the eruption has disappeared, the patient may no longer

be sensitive when the patch test is performed but may have been sensitive at the time he had the eruption and when he was industrially exposed. Or, a negative patch test reaction may be due to the fact that the patch test never accurately reproduces actual working conditions, such as friction, maceration, heat, cold, and sunlight, which may be additional factors adding to the irritating effect of the substance to which the patient is exposed. Or, it may be that the concentration of the chemicals applied as a patch test may not be as great as they actually were during industrial exposure. Or, finally, the actual industrial irritant may not have been discovered and applied as a patch test. When negative reactions are obtained from patch tests with substances encountered in the work room and the dermatitis which the worker has resembles a contact dermatitis, an effort must be made to perform patch tests with materials met with in the patient's home which may be the causes of dermatitis. For instance, certain plants, or perhaps paints or even new furniture. Tests of this kind will in some cases show that the patient is sensitive to materials met with outside of industry and not sensitive to the materials which he meets in his place of employment.

The technic of performing patch tests is important in obtaining and evaluating results. When patch testing for hypersensitivity to general irritants, such dilutions must be used in the tests as are known not to irritate the normal skin (Ref., Schwartz, Louis: Sensitivity to External Irritants in Industry, *New York State Journal of Medicine,* 36, 24 (Dec. 15), 1936. The insulating material inserted between the chemical and the adhesive plaster should be a non-irritant substance, such as unvarnished cellulose or, better still, a thin sheet of mica may be used. The resin on waterproof cellophane itself may be an irritant as may be some of the compounds in dental rubber. The adhesive plaster used to hold the patch in place often itself causes an erythema of the skin (Ref., Schwartz, Louis and Peck, Samuel M. The Irritants in Adhesive Plaster, *Public Health Reports,* 50, 24 (June 14), 1935.

At the time the patches are removed there may be no reaction present, but some time later—a few hours to a few days—a delayed reaction may develop at the site of the patch. There is some dispute as to the significance of delayed reactions. Some hold that the skin was sensitized by the patch test but I think that in our present state of knowledge we should regard delayed reactions as denoting hypersensitivity just as undelayed reactions do. Patch tests properly performed and evaluated can be of great help in the diagnosis of industrial dermatitis, but if improperly performed and evaluated, they may lead to confusing and unjust conclusions.

Fungus infections also offer a problem in differential diagnosis from industrial dermatitis. A large percencentage of workers are affected with mycotic infections in some form or other. Epidermophytosis, trichophytosis, tinea cruris and tinea versicolor are common skin diseases. Allergic reactions in the form of dermatoses on distant parts of the body resulting from these fungus infections are recognized by allergists and dermatologists. These allergic reactions or phytids may be confused with industrial dermatitis. If the phytids or the mycotic infections appear on portions of the body not exposed to industrial irritants, they are not so apt to cause doubts in diagnosis, but they often appear on the hands and here they are apt to cause trouble in diagnosis. The various tests with fungus extracts, such as tricophytin, are of little value in making a differential diagnosis because nearly every

one has or has had a fungus infection, and positive reactions are the rule. They are of more value when the tests are negative, because then they tend to show that the present eruption is not of fungus origin, although even here it is not absolute proof, because among other reasons the causative fungus may not be the one from which the testing extract is made. Then again, the fact that a worker has a fungus infection does not preclude the fact that he may also have an industrial dermatitis. In fact, it is held by some dermatologists that the presence of a fungus infection predisposes to hypersensitivity to other external irritants. Patch testing may offer some help but here again the industrial exposure, the history of the eruption, the site of the lesions and their morphology must all be carefully considered before a diagnosis is made.

Chronic eczemas, more or less generalized and of long standing offer very difficult problems in etiology, especially when they are complicated by secondary infections. Patch tests are of little value in most of these cases, because polysensitivity is usually present. It is impossible to determine whether the dermatitis and polysensitivity was caused by industrial exposure or whether the sensitivity was present before the industrial exposure or whether the dermatitis and sensitivity were caused by exposure to substances encountered outside of the work-room.

Cases sometimes appear before compensation boards claiming compensation for disability due to a dermatitis which the worker claims to have suffered as a result of his occupation, but which at the time the case is being heard, has disappeared. In these cases, it is also difficult to determine the causative factor. If patch tests done at this time are positive, they are of great help, but if negative, they are not, because the patient may have developed an immunity by his recovery.

From these facts it can be seen that there is no one characteristic symptom on which a diagnosis of an industrial dermatitis can be made. The worker's occupation, the history of his skin eruption, its site and morphology and evaluation of the patch tests must all be taken into consideration by a dermatologist familiar with the substances and the processes of the worker's occupation before we can hope to make a true diagnosis as to the etiology of a dermatitis in a worker exposed to an occupational skin hazard.

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